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ABSTRACT

Systematic cognitive development, through planned experiences in the context of course work, should be a component of teacher education programs, together with opportunities to apply that learning in practicum settings. Training in cognitive skills (analysis of error, comparison and contrast, categorization, identifying relationships among disparate elements, understanding hierarchical systems, prediction, and collecting and applying logical evidence to problem solving situations) would be important. This report presents a brief review of related literature on enhancing cognitive development in children and adults. An analysis is presented of two research studies: (1) a preservice study in which learners improved problem solving strategies in cognitive areas such as comparison, categorization, orientation in space, analytic perception, and logical reasoning; and (2) an inservice study in which teachers were trained to teach cognitive skills to pupils and which considered ways these skills could be applied to general teacher classroom behavior and adult life. A model is presented for incorporating cognitive education as a core component in teacher education programs. (JD)

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THINKING SKILLS: A CRITICAL NEW ROLE IN TEACHER EDUCATION

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Rationale

Much focus is currently being placed on programs in "cognitive education" for students, but relatively little systematic focus has been given to the impact of those skills on the persons with the major responsibility for teaching them, namely, teachers. Because teachers themselves often lack adequate cognitive development from their own schooling, they:

1. are often unprepared to foster such development in their students,
2. only partially able to identify the cognitive structures underlying curriculum, and
3. fail to apply systematic thinking to the instructional task.

For these reasons, it is proposed that a component of all teacher education programs be systematic cognitive development through carefully planned experiences in the context of course work, together with opportunities to apply that learning in practicum settings.

Teacher educators considering the inclusion of that component must identify the critical cognitive strategies for the adequately "mediated" learner (whether adult or child). Specific teacher training in at least the following cognitive skills would be important: analysis of error, comparison and contrast, categorization, identifying relationships between apparently disparate elements, understanding of hierarchical systems, prediction, and collecting and applying logical evidence to problem-solving situations. Investigations are now under way to assess the effects of such teacher training on general classroom teacher behavior. This report will present a brief review of related literature, an analysis of two research studies now underway, and a model for incorporating cognitive education as a core component on teacher education programs.

Review of Literature

An identifiable body of research has investigated the methods of enhancing cognitive development in children. Thus, teachers having training in the use of cognitive programs for children would make use of the research that has been done in this area. Notable among these would be the work of Feuerstein (1980), Brown (1978), Henker, et al. (1980), Klein (1981), Loper (1980), Narrol et al. (1978), and Vygotsky (1962).

However, relatively little systematic research has been done in the area of cognitive training for teachers. The works of Orme (1977) and Waksman et al. (1978) identify some adult cognitive outcomes from training teachers in how to teach cognitive skills to children. Clark and Yinger (1979) presented a summary of studies of teacher training. Taylor (1970) analyzed teacher ability to plan systematically; Zahorik (1975) added to this work; Johnson (1972) focused on teacher judgment in cognitive terms; Mondol (1973) investigated the effects of modifying the situations in which teachers apply alternative strategies in problem-solving; Marland (1982) developed three models of teacher thinking; Duff (1977) found a loose relationship to exist between a teacher's theory and his/her behavior; and works by Gage (1978) and Shulman and Elstein (1975) have called for studying the mental processes of teachers at work.

Further support for the importance of cognitive education as a component of teacher education is found in the writings of: Bateman (1971) who focused on the essential elements of teaching; Marx and Winne (1982) in their analysis of the results of the National Teacher Examination and the needs which it identifies; and Morine-Dershimer (1982) establishing some methods for

researching the thinking of teachers. Herrick (1962) underscored the need for teachers to use critical thinking in identifying important understandings and processes when preparing instructional objectives. The need for the teacher to diagnose cause of student difficulty and to prescribe beyond trial and error was observed by Carbone (1980; Brabeck (1980) outlined five core components in the critical thinking dimension of cognitive development:

1. Recognition of the problem which requires logical solution;
2. Analysis of the problem including recognition of assumptions and invalid inferences;
3. Weighing of available evidence;
4. Validation of arguments;
5. A decision-making phase.

In addition, Renner (1975) demonstrated positive cognitive growth in teacher trainees as the result of pre-service training in methods of teaching science using well-structured reasoning activities. Finally, Schenkat and Battaglini (1980) have created a strong case for reasoning skills in pre-service education, particularly in teaching teachers to operationalize what they are learning about ways to organize instruction for the special-education child; their work makes use of Perry's work on the identification of the nine levels of cognitive behavior which are characteristic of the college-age student (1968; 1979-80; 1981).

The April 27, 1981 issue of Newsweek presented an article, "Teachers in Trouble," which contained startling information about the inadequate academic functioning of many teachers (especially beginning teachers) in America today. Before and since that time, the agendas of numerous conferences of teacher educators has included breast-beating about the need for higher standards of

admission to teacher education programs and remediation of "basic skills" among teacher trainees. But the implementation of higher standards cannot be a realistic solution to the perceived shrinking pool of strong teacher candidates -- that "solution" will only limit further the numbers of potential teachers; and continued traditional basic skills remediation for teacher trainees is apparently insufficient because supervisors are continuing to report these deficiencies in beginning teachers. In addition, well before the present state of alarm, teacher educators and supervisors had expressed concern about the beginning teacher's lack of ability to plan and organize a curriculum for pupils. Several studies (Fuller, Pilgrim, & Freeland, 1967; Field, 1979) have identified "stages" in teacher development; conventional wisdom holds that it is inappropriate to expect a beginning teacher to grasp the totality of a curriculum and begin to see pupils as individuals until well into the second or third year of teaching because so much of the early months of teaching is based on "day-to-day survival."

It may be, however, that such systematic behavior may not need to be a later stage of development, but instead can begin to become part of the pre-service teacher's behavior during the first practicum experience. It may also be that the difficulty in acquiring "basic skills" for some future teachers (and many other college students) is related to missing prerequisites for learning which the traditional remediation programs do not include.

An operational definition of specific teaching behaviors as related to cognitive factors has been presented clearly by Costa (1982) using four stages of the teaching act -- planning, interaction, analyzing and evaluating, and applying. Within the Planning stage, specific cognitive behaviors include

selecting alternative strategies, overcoming the teacher's own egocentrism, classification, and task analysis. In the Interactive stage, cognitive behaviors include use of the strategy, interpreting cues, and making temporal decisions. In the Analyzing and Evaluating stage, the teacher must carry out such behaviors as comparison, and distinguishing cause and effect. Finally, in the Applying stage, teachers must "project" one classroom experience to the next, and carry out such cognitive behaviors as planning through hypothetical thinking and planning based upon principles using an analysis of previous lessons (Costa, 1982). This analysis should apply equally well to the pre-service and the in-service teacher, and was useful in the interpretation of the results of the two studies to be reported below.

Special Program in Cognitive Education

A special cognitive intervention program (Instrumental Enrichment, Feuerstein, 1980) was selected as the set of strategies to be tested in the present study because it is well tested in the education of adolescent and adult populations outside of teacher-training institutions, and because it appears to be the most comprehensive of the currently available cognitive education programs.

Instrumental Enrichment is a special content-free paper-and-pencil intervention program in which the learner improves problem-solving strategies in fourteen cognitive areas, such as comparison, categorization, orientation in space, analytic perception, and logical reasoning. The instructor mediates the learner's work with these materials and provides insight through discussion about the application of these strategies to subject matter and to life situations. Prior work with the program has demonstrated its success in

improving cognitive functioning in adolescents and adults in a variety of educational settings in the United States and in three other countries.

Two separate investigations are being carried out during 1982-83 on the impact of this program on two separate pre-service and in-service teacher populations.

A. Pre-Service Education Study

Although the ideal model for pre-service cognitive education would involve incorporating some elements in all foundations and methods courses, the present study had to focus on application in the context of two foundations courses only. This limited investigation, however, was designed to make the case for inclusion of cognitive education in the entire spectrum of pre-service work.

Fifteen undergraduate junior-year students in a Curriculum Foundations course and fourteen undergraduate junior-year students in an Educational Psychology course are the experimental subjects of the study. The instructors of both courses, one of whom is the author, had been previously trained in-depth (during a twelve full-day period) in the methods and materials of the Instrumental Enrichment program.

At the beginning of each course, each subject took the Uncritical Inference Test (Haney, 1967). At the end of each course, each subject will again take both tests. In addition a control group of ten students in a parallel Educational Psychology course at the same institution took the Uncritical Inference Test on a pre and post basis for purposes of comparison with the two experimental groups.

In both courses, paper-and-pencil activities are being included in every second class session throughout the semester, usually for not more than thirty minutes on each occasion. The activities were drawn from "instruments" related to the skills of: projection of virtual relationships, orientation in space, comparison, analytic perception, following precise instructions, categorization, and identifying relationships. Each activity is followed by a discussion for insight into how that particular skill could be related to: (a) teaching children the same skill, (b) the other subject matter of the course itself, (c) professional teaching behaviors such as lesson-planning and materials-selection, and (d) life or "outside world" functioning such as finding a job and selecting a mate.

B. In-Service Education Study

Ten hearing teachers at the Model Secondary School for the Deaf at Gallaudet College were identified as the target group for training in cognitive education. Each individual is a member of a six-day training course in Instrumental Enrichment during a seven-month period in 1982-83. The overt purpose of the training is to teach the content and methodology of this instructional program so that these teachers would be qualified to teach cognitive skills to pupils; however, throughout the training these teachers are given multiple opportunities to discuss ways in which these cognitive skills could be applied to general teacher classroom behavior and to adult life.

Three separate measures are being used to analyze the effect of cognitive training on teaching behaviors: the Uncritical Inference Test (Haney, 1967), a specially-developed Teacher Self-Rating Scale, and the supervisory evaluation form that is used regularly by program supervisors at the School.

The Uncritical Inference Test was administered at the beginning of the training in the Fall of 1982, and will be administered again at the end of the training in May of 1983. The Teacher Self-Rating Scale was developed by the author to include items related to planning and systematic approach to problem-solving, involved in the daily work of teaching, and is included in Appendix A. The supervisors' rating form is being used on three occasions to assess teaching behaviors by supervisors who were not formally aware of the content of the specially training program; thus, these data, coded for statistical purposes, are free of observer bias in regard to the particular cognitive training program.

Proposed Model: Cognitive Education as a Core Component in Teacher Education

Based on the preliminary observations from the two studies described above and on the rationale for the broad applicability of cognitive training for adult functioning, the following model is now presented for inclusion of such training in all pre-service teacher education programs.

As with the cognitive education of children, the proper inclusion of content-free activities in teacher education programs presents a real challenge because these activities: (a) do not seem to "fit" into a convenient "box" in any one subject area, and (b) appear to "take time away" from the traditionally required subjects in the curriculum. The response to both of these problems is that cognitive training must be integrated into

various components of the existing teacher education because it provides the missing prerequisite enabling skills which will deepen and broaden the teacher's teaching behavior on the job. Thus, if cognitive training activities are included several times a week in each pre-service course and then applied during the practicum setting, no one course instructor bears the entire responsibility; and, the pre-service teacher has the opportunity to make the broadest possible application of those skills to his or her teaching and life.

The model, therefore, would not consist of adding one or two courses focusing purely on cognitive training. Instead, it would consist of the following components:

a. Training instructors of teacher education courses in the methods and materials of cognitive education, and the orientation of practicum supervisors to the rationale for cognitive education as a focus in teacher education;

b. Coordinating agreement among these teacher training staff members as to which components each will include in their course work, so as to achieve maximum reinforcement and minimal overlap;

c. Allotting one segment of every second class session in each foundations and methods course to: (1) a cognitive skill activity, (2) discussion about how that skill would be applied to the topic of the course, (3) discussion about how that skill would be applied to the school curriculum, and (4) discussion about how that skill would be applied to professional and personal life; cognitive activities would focus on the skills of planning, analysis, identification of problem-solving strategies, breaking egocentricity, categorization, comparison, relating cause and effect, logical thinking, and synthesis;

d. Orienting practicum school personnel to the rationale and methods of cognitive education in anticipation of the trainee's arrival;

e. Expecting that each trainee during the practicum experience apply cognitive skill development on a regular basis throughout the practicum period;

f. Reinforcing the use of cognitive education methods during the practicum seminar by discussion of: (1) successes and problems in the teaching of cognitive skills to practicum children, and (2) additional insights gained about the application of those skills to the trainee's own professional and personal life;

g. Follow-up assessment of program graduates to determine the extent to which this specialized component has or has not affected their professional performance in comparison with prior graduates of the teacher-training program.

Such a model clearly requires an unusual professional commitment of time and energy. However, the results of the investigations reported here in addition to the national sense of alarm about the general performance of teachers demand that such a model be implemented now.

As a next step in the effort to improve the education of teachers, let us call for specific teacher-training programs to come forward and adapt and then test this model on a larger scale. The present investigator and others who are similarly convinced stand ready to share detailed information and results to those teacher educators who are ready to take this necessary leap.

Conclusion

The inclusion of cognitive training as a core component in a teacher education program therefore is based on the need for the following outcomes in teacher behavior:

1. Better selection of curricular foci for the classroom.
2. Improved analysis of curriculum prepared outside the classroom, for classroom use.
3. Improved balance in the selection of instructional techniques.
4. Better diagnostic awareness of cognitive problems of students.
5. Appropriate preparation for the teaching of cognitive development programs to pupils.
6. More precise analysis of instructional problems.

7. Consistent conscious application by the teacher of systematic problem-solving strategies to all aspects of his or her teaching life, including curriculum, instruction, evaluation, community relationships, and diagnosis of student needs.

To summarize, the cognitively better developed pre-professional will become not only a better professional, but also a more fully functioning human being in society.

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